NOAA Water Level (Tidal) Data of 175 Stations for the Coastal United States and Other Non-U.S. Sites

Metadata also available as

Metadata:

- Identification_Information
- Data_Quality_Information
- Spatial_Data_Organization_Information
- Spatial_Reference_Information
- Entity_and_Attribute_Information
- Distribution_Information
- Metadata_Reference_Information

Identification_Information:
    Citation:
        Citation_Information:
            Originator:
                Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Center for Operational Oceanographic Products and Services (CO-OPS)
            Publication_Date: 2002
            Title:
                NOAA Water Level (Tidal) Data of 175 Stations for the Coastal United States and Other Non-U.S. Sites
            Geospatial_Data_Presentation_Form: map
            Publication_Information:
                Publication_Place: Silver Spring, MD
                Publisher:
                    NOAA's Ocean Service, Center for Operational Oceanographic Products and Services
            Online_Linkage: <http://co-ops.nos.noaa.gov/>
    Description:
        Abstract:
            The National Ocean Service maintains a long-term database containing water level measurements and derived tidal data for coastal waters of the United States and U.S. territories. These data allow for the determination and maintenance of vertical reference datums used for surveying and mapping, coastal construction, waterborne commerce, water level regulation, marine boundary determination, and tide prediction, and for the determination of long-term water level variations (e.g. trends). The data also supports other U.S. government programs, including the National Weather Service (NWS) Tsunami Warning System, the NWS storm surge monitoring programs, and the NOAA Climate and Global Change Program.

The database contains an extended series of water level measurements recorded at different tide observation stations. These data are processed to generate a number of products, including monthly and yearly averages for mean tide level, mean sea level, diurnal tide level, mean high and low water, mean range, diurnal mean range, monthly extremes for high and low waters, and frequency and duration of inundations (the number of times and length of time at which the water level has equaled or exceeded a specific elevation for a period of analysis).

Data are compiled for coastal waters of the United States, Puerto Rico, the Virgin Islands, and U.S. territories in the Pacific region. Water levels are monitored from a network of over 175 permanent, continuously operating tide observation stations and from numerous stations operated for short-term and long-term projects.

Water level measurements are compiled for a variety of observation periods, depending upon the location. For some tide observation stations, records date back to the late 1800s. Observed water level values are compiled primarily at six minute increments, however, some stations provide real-time data for planning and emergency situations.The observed values are processed to generate mean and extreme values for different temporal intervals, as noted above.

The data consist simply of elevations of water, in feet, observed at specific geographic locations and temporal periods. All water level measurements are referenced to staff '0' and can be referenced to other datums, such as the North American Vertical Datum of 1988 (NAVD 88). Recent data are recorded to the hundredth of a foot; data collected prior to the mid-1960s are recorded to the tenth of a foot.

The foundation of the water level database is the National Water Level Observation Network (NWLON), a system of long-term operating tide stations maintained by NOS. Data also are obtained through short-term and long-term cooperative projects with other federal, state, and local agencies and governments to accomplish mutual goals in water level measurement. For example, tide stations are operated temporarily for marine boundary determination and hydrographic survey projects. NOS also maintains several cooperative stations with foreign governments for the Climate and Global Change Program.

Indexes of tide stations maintained by NOS are available which include for each station the latitude, longitude, dates of observations, bench mark sheet publication date, and tidal epoch. NOS also issues tidal bench mark sheets upon completion of a data collection series or as needed for long-term NWLON stations. Tidal bench mark sheets provide location descriptions and vertical elevations referenced to tidal datums of the station bench marks. A table of tidal datums and the 1929 NGVD, when available, are referenced to the station reference datum.

A number of products are issued monthly and annually, for free or on a cost recovery basis. The products are distributed on either hard copy, floppy disk, CD, or over the web and include the following:

o Tide Observation Station Lists o Tides, 6-Minute Heights o Tides, Hourly Heights of Tides, Times and Heights of High and Low Waters o Tides, Monthly Mean

Summaries o Tidal Bench Mark Sheets with Tidal Datums o Frequency and Duration Analysis of Tidal Water Levels o Daily Mean Sea Level

Real-time data are also transmitted to the Center for Operation Oceanographic Products and Services (CO-OPS) and are distributed in limited quantities, in near real-time to users via the web at <http://co-ops.nos.noaa.gov/> .

CO-OPS also provides a number of information services for which it charges a fee, based on a professional service rate of $30.00 per hour. The services include the following:

o Computation of bench mark elevations and tidal datums. o Computation of the NAVD88 referenced to other tidal datums. o Computation of historical tidal datums. o Providing tidal zoning for hydrographic projects. o Preparing and reviewing certified documents for court use. o Retrieval of requested historical data sets not provided over the web.

Purpose:
The Center for Operational Oceanographic Products and Services (CO-OPS) collects, analyzes and distributes historical and real-time observations and predictions of water levels, coastal currents and other meteorological and oceanographic data.
Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 18540630
Ending_Date: present
Currentness_Reference: Data collected every 6 minutes
Status:
Progress: In work
Maintenance_and_Update_Frequency: Data updated every 6 minutes
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -180.0
East_Bounding_Coordinate: 180.0
North_Bounding_Coordinate: 70.4
South_Bounding_Coordinate: -54.8
Keywords:
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: tide
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Theme_Keyword: tide predictions
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Theme_Keyword: datum
Theme_Keyword: oceans

Place:
> *Place_Keyword_Thesaurus:* None
> *Place_Keyword:* U.S. Exclusive Economic Zone
> *Place_Keyword:* Coastal United States and U.S. Territories

Temporal:
> *Temporal_Keyword_Thesaurus:* None
> *Temporal_Keyword:* real-time

Access_Constraints: None

Use_Constraints:

Preliminary data have not been subjected to the National Ocean Service's quality control or quality assurance procedures and do not meet the criteria and standards of official National Ocean Service data. They are released for limited public use as preliminary data to be used only with appropriate caution.

Predicted Tidal Data

The accuracy of the tide predictions is different for each location. Periodically we do a comparison of the predicted tides vs. the observed tides for a calendar year. The information generated is compiled in a Tide Prediction Accuracy Table. We work to insure that the predictions are as accurate as possible. However, we can only predict the astronomical tides, we cannot predict the effect that wind, rain, freshwater runoff, and other short-term meteorological events will have on the tides.

In general, predictions for stations along the outer coast are more accurate than those for stations farther inland; along a river, or in a bay or other estuary. Inland stations tend to have a stronger non-tidal influence; that is, they are more susceptible to the effects of wind and other meteorological effects than stations along the outer coast. An example of an inland station which is difficult to predict is Baltimore, Maryland. This station is located at the northern end of Chesapeake Bay. Winds which blow along the length of the bay have been known to cause water levels to be 1-2 feet above or below the predicted tides.

Stations in relatively shallow water, or with a small tidal range, are also highly susceptible to meteorological effects and thus difficult to accurately predict. At these stations, short-term weather events can completely mask the astronomical tides. Many of the stations along the western Gulf of Mexico fall into this category. An example is Galveston, Texas. This station is in a bay which is relatively shallow and has a small opening to the sea. At this station it is possible for meteorological events to delay or accelerate the arrival of the predicted tides by an hour or more.

Point_of_Contact:
> *Contact_Information:*
> > *Contact_Organization_Primary:*
> > > *Contact_Organization:*
> > > > NOAA's Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS)

> > *Contact_Address:*
> > > *Address_Type:* mailing and physical address
> > > *Address:* 1305 East-West Highway N/OPS3
> > > *City:* Silver Spring
> > > *State_or_Province:* MD
> > > *Postal_Code:* 20910

Country: U.S.A.
Contact_Voice_Telephone: 301-713-2981
Contact_TDD/TTY_Telephone: 301-713-2816
Contact_Facsimile_Telephone: 301-713-4392
Contact_Electronic_Mail_Address: Stephen.Lyles@noaa.gov
Hours_of_Service: Monday-Friday, 9am-5pm, Eastern Standard Time
Data_Set_Credit:
NOAA's Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS)
Native_Data_Set_Environment:
Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 2; ESRI ArcCatalog 8.2.0.700

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
One hundred and eighty one, one-second water level samples centered on each tenth of an hour are averaged, a three standard deviation outlier rejection test applied, the mean and standard deviation is recalculated and reported along with the number of outliers.
Quantitative_Attribute_Accuracy_Assessment:
Attribute_Accuracy_Value: 0.02 m (Individual measurement) and 0.005 m (monthly means)
Attribute_Accuracy_Explanation: Relative to Datum
Logical_Consistency_Report:
Preliminary data

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Completeness_Report:
Preliminary data

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        Source_Citation:
            Citation_Information:
                Originator:
                    NOAA's Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS)
                Publication_Date: Unknown
                Title: National Water Level Observation Network

> > > *Geospatial_Data_Presentation_Form:* graphic plots, tabular digital data
> > > *Publication_Information:*
> > > > *Publication_Place:* Silver Spring, MD
> > > > *Publisher:*
> > > > > NOAA's Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS)
> > > *Other_Citation_Details:*
> > > > CO-OPS Data Disclaimer: These raw data have not been subjected to the National Ocean Service's quality control or quality assurance procedures and do not meet the criteria and standards of official National Ocean Service data. They are released for limited public use as preliminary data to be used only with appropriate caution.
> > > *Online_Linkage:* <http://co-ops.nos.noaa.gov/>
> > *Type_of_Source_Media:* online, CD ROM, 3 1/2" floppy disk, paper
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> > > > > *Beginning_Date:* 18540630
> > > > > *Ending_Date:* present
> > > *Source_Currentness_Reference:* When first recorded gage was installed until present.
> > *Source_Citation_Abbreviation:* National Water Level Observation Network (NWLON)
> > *Source_Contribution:* NWLON and NOS Water Level Stations
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> > *Process_Description:*
> > > Data is recorded and transmitted then goes through a quality control procedure and is loaded into a database.
> > *Process_Date:* Not complete

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> > > *Geographic_Coordinate_Units:* Decimal degrees

Entity_and_Attribute_Information:

Overview_Description:
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        CO-OPS water level stations collect data using six different sensor types (However, note that not every water level station collects data using all six sensor types):

        - Water Level Gage- scientific instrumentation used to measure the rise and fall of the tide (water level). - Air Temperature Sensors- scientific instrumentation to measure air temperature. - Water Temperature Sensors- scientific instrumentation to measure water temperature. - Wind Measurement Sensor- scientific instrumentation to measure wind speed and direction. - Barometric Pressure Sensors- scientific instrumentation to measure barometric pressure. - Conductivity Sensors- scientific instrumentation to measure conductivity.

    Entity_and_Attribute_Detail_Citation:
        Specific Water Level Gages:

        - "Aquatrak", an air acoustic sensor whose accuracy can be 0.02 meters (individual measurement) and 0.005 meters (monthly means). One hundred and eighty one, one-second water level samples centered on each tenth of an hour are averaged, a three standard deviation outlier rejection test applied, the mean and standard deviation is recalculated and reported along with the number of outliers.

        - "Dual Orifice Bubbler Paroscientific Quartz Sensor"- A pressure transducer sensing device for water level measurement. A relative transducer is vented to the atmoshpere and pressure readings are made relative to atmospheric pressure. An absolute transducer measure the pressure at its location. The readings are then corrected for barometric pressure taken at the surface. The accuracy, relative to the Datum, is 0.02 meters (individual measurement) and 0.005 meters (monthly means). Thirty-six five second water level samples centered on each tenth of an hour are averaged, a three standard deviation outlier rejection test applied, the mean and standard deviation is recalculated and reported along with the number of outliers.

        - "BEI Absolute Shaft Angle Encoder, Model # MT-40D (Float)"- The accuracy, relative to the Datum, is 0.006 meters (individual measurement) and 0.003 meters (monthly means). 181 one-second water level samples centered on each tenth of an hour are averaged, a three standard deviation outlier rejection test applied, the mean and standard deviation is recalculated and reported along with the number of outliers.

        - "Single Orifice Bubbler STrain Gauge Sensor (Pressure)"- a back-up water level sensor with an accuracy, relative to the Datum, of 0.05 meters (individual measurement) and 0.02 meters (montly means).181 one-second water level samples centered on each tenth of an hour are averaged, a three standard deviation outlier rejection test applied, the mean and standard deviation is recalculated and reported along with the number of outliers.

        Air Temperature Sensor-"Yellow Springs Instrument Air Temperature Sensor-" Accuracy for this sensor is 0.2 Deg. C. Twenty equally spaced samples collected over a 2 minute period are averaged for each measurement.

        Water Temperature Sensor- "Yellow Springs Instruments Water Temperature

Sensor." It's accuracy is 0.2 Deg.C. 20 equally spaced samples collected over a 2 minute period are averaged for each measurement.

Wind Measurement Sensor, "R.M. Young Wind Sensor." It's accuracy is 0.3 m/sec (speed) and 3 Deg. (direction, with spped threshold 1.0 m/sec). Speed - 2 minute scalar average of 1 second wind speed measurements collected prior to each tenth hour. Wind Direction - 2 minute unit vector average of wind direction collected prior to each tenth hour. Wind Gust - The maximum 5 second moving scalar average of wind speed that occurred during the previous hour.

Barometric Pressure Sensor, "Setra or Vaisala Barometric Pressure Sensor." It's accuracy is 0.5 mbar. Twenty equally spaced samples collected over a 2 minute period are averaged for each measurement.

Conductivity Sensor, "Falmouth Sci. or Greenspan Conductivity Sensor." Accuracy for Conductivity is 0.1 mS/cm and accuracy for Temperature is 0.05 Deg. C. Twenty equally spaced samples collected over a 2 minute period are averaged for each measurement.

Distribution_Information:
    Distributor:
        Contact_Information:
            Contact_Organization_Primary:
                Contact_Organization: NOAA's Ocean Service, CO-OPS
                Contact_Person: Stephen Lyles
            Contact_Address:
                Address_Type: mailing and physical address
                Address: 1305 East West Highway N/OPS
                City: Silver Spring
                State_or_Province: MD
                Postal_Code: 20190
                Country: U.S.A.
            Contact_Voice_Telephone: 301-713-2981
            Contact_TDD/TTY_Telephone: 301-713-2816
            Contact_Facsimile_Telephone: 301-713-4392
            Contact_Electronic_Mail_Address: stephen.lyles@noaa.gov
            Hours_of_Service: Monday-Friday, 9am-5pm, Eastern Standard Time
    Resource_Description: Live Data and Maps
    Distribution_Liability:
        Preliminary Data

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                    Network_Address:
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            Offline_Option:
                Offline_Media: CD-ROM
                Recording_Format: Data burned to CD-ROM
    Fees:
        There is a fee for services rendered by CO-OPS. A request for water level data, benchmark information, Great Lakes data and information typically costs $48.00.

Metadata_Reference_Information:
    Metadata_Date: 20021217
    Metadata_Contact:
        Contact_Information:
            Contact_Organization_Primary:
                Contact_Organization: NOAA's Ocean Service, CO-OPS
                Contact_Person: Chief, Products and Services Division (CO-OPS)
            Contact_Position: Chief, Products and Services Division (CO-OPS)
            Contact_Address:

Address_Type: mailing and physical address
Address: 1305 East-West Highway N/OPS3
City: Silver Spring
State_or_Province: MD
Postal_Code: 20910
Country: U.S.A.
Contact_Voice_Telephone: 301-713-2981
Contact_TDD/TTY_Telephone: 301-713-2816
Contact_Facsimile_Telephone: 301-713-4392
Hours_of_Service: Monday-Friday, 9am-5pm, Eastern Standard Time
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Extensions:
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